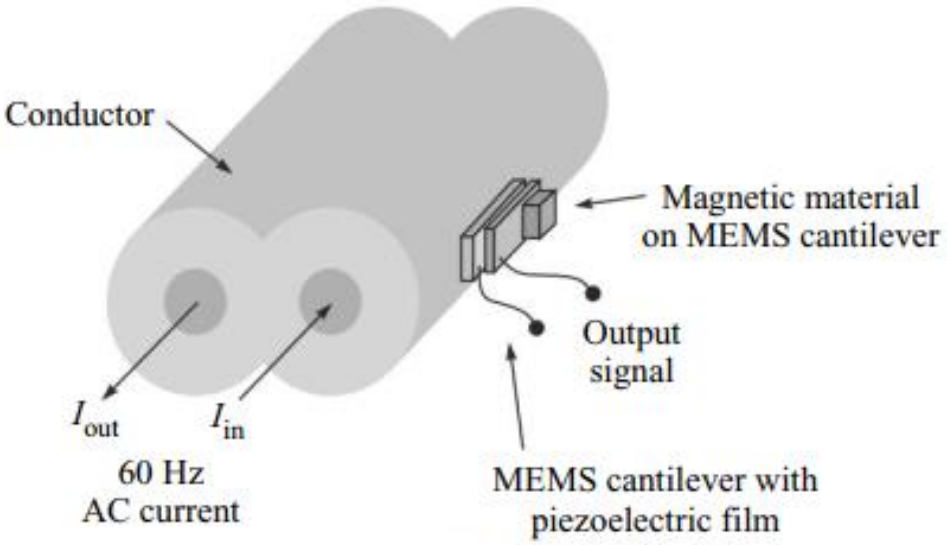

Fig. 8.4 *An MEMS cantilever based magnetic sensor*

This MEMS cantilever-based magnetic sensor works as follows:

- A **60 Hz AC current** in the conductor generates a **time-varying magnetic field**.
- This magnetic field exerts a force on a **magnetic material** at the end of the cantilever, causing it to **vibrate**.
- The **vibration** of the cantilever generates a **piezoelectric voltage** in the attached piezoelectric film.
- This output voltage can be measured to indicate the **strength of the current** in the conductor.

In short, the sensor detects current by measuring the magnetic field-induced vibration, which translates into a measurable voltage.

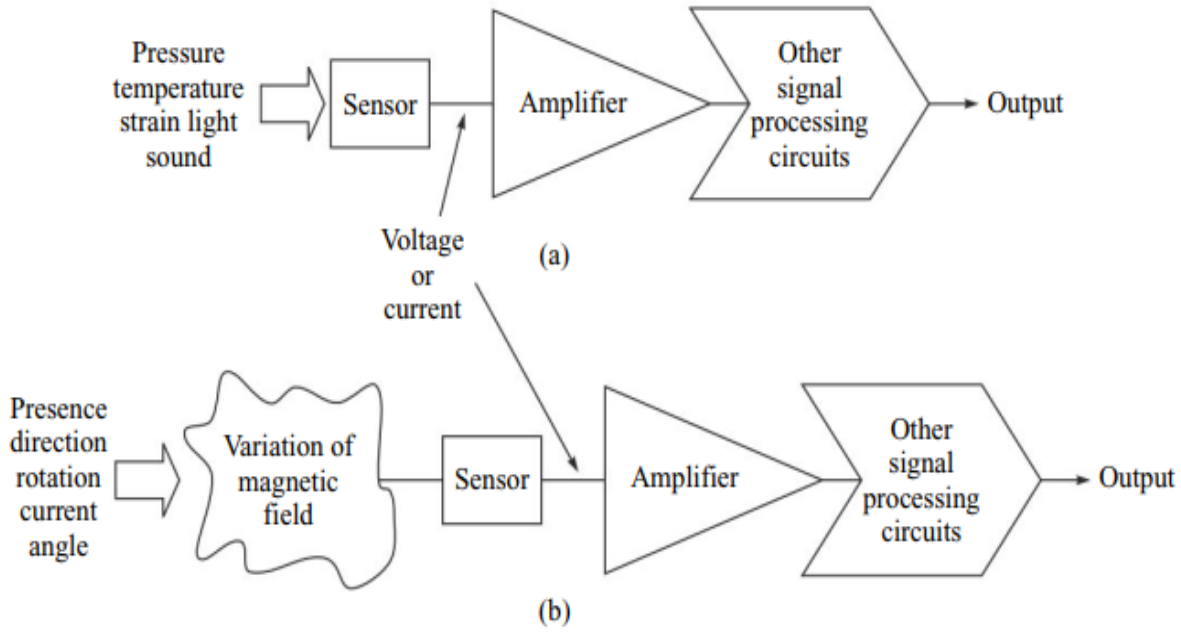

Fig. 8.2 *(a) A typical sensor, (b) An illustration of magnetic sensor*
Courtesy: Honeywell, Inc.

Magnetic Sensing and Detection (8.3) – Summary

Magnetic Sensors:

- Initially used for **navigation** (direction finding), magnetic sensors have been around for a long time.
- Today, they are still essential for navigation, but their applications have expanded significantly.

Advancements:

- Magnetic sensing technology has improved, offering **better sensitivity**, **greater capability**, and **smaller sizes**.
- Modern sensors come with **built-in electronics** for signal processing, making them more efficient and versatile.

Differences from Other Sensors:

- Unlike general sensors (Fig. 8.2a), which detect various physical properties (like pressure, temperature, or light), magnetic sensors (Fig. 8.2b) specifically detect **magnetic field variations**.
- Magnetic sensors are designed to sense **presence, direction, rotation, current, or angle** based on the magnetic field.

In simple terms, magnetic sensors have evolved from simple navigation tools to versatile devices with advanced electronics, enabling them to perform precise magnetic field detection in various applications.